

REMARKS

The Office action dated October 30, 2008 has been received and its contents carefully noted. Claims 5, 6, 8-11, 14 and 16-31 were pending and indicated as rejected.

By this Response, claims 5, 6 and 27 have been amended, while new claims 32 to 34 have been added. No new subject matter has been added. Support for all claimed subject matter can be found in the original disclosure (*e.g.*, see page 14 for an example of support for the pressure range amendments).

Accompanying this Response is a Petition for a 2-month Extension of Time with the requisite fee.

Claim Rejections - 35 U.S.C. § 103(a)

In the Office Action the claims stand rejected as outlined below:

Claims	Rejection Group	Reference(s)
5, 6, 8, 14-16 and 20-30	103(a)	Raajimakers et al., Nowak et al, (or to Forster et al.), and Qian et al.
9 and 17	103(a)	Raajimakers et al., Nowak et al, (or to Forster et al.), Qian et al., and Brcka
10-11, 18-19 and 31	103(a)	Raajimakers et al., Nowak et al, (or to Forster et al.), Qian et al., Brcka, and Liu et al.

In the description in the Office Action of the obviousness rejection A above, Raajimakers et al is recognized as failing to disclose the following:

- A) a flat conducting member disposed above the top wall, opposed to the mount, being permanently grounded and free from direct electrical connection with a high frequency electric power source, and*
- B) high frequency electric power supplied to the mount and then supplied to the antenna.*

In an effort to remedy the noted deficiency A) reference is made to Nowak et al disclosing --

- i) a flat conducting member 24 disposed above the top wall for capacitively coupling plasma to the chamber (see fig. 1 and its description);
- ii) where the conducting member can be permanently or at all times grounded during this process and can be in a state free of direct electrical connection with a high frequency electric power source.

In the Alternative (relative to the noted deficiency A) there is set forth that in the Office Action Forster et al. discloses "*initiating capacitive coupling using a permanently grounded conducting mount 180 opposed to a substrate and in a state free of direct electrical connection with a high frequency power source (see fig. 3 and its description)*".

With respect to A, it is respectfully submitted that the indication that member 24 of Nowak is disposed above the top wall is in error in that "ceiling electrode 24" of Nowak does represent the "top wall" in that embodiment. Accordingly, the assertion that ceiling electrode 24 of Nowak is above a top wall is respectfully submitted not to be accurate in the context of the Nowak embodiment being relied upon.

With respect to the alternative discussion concerning Forster, the indication that electrode 180 of Forster is "*in a state free of direct electrical connection with a high frequency power source*" is respectfully submitted to be in error. That is, as seen from the description below the electrode of Forster is directly electrically connected to an RF source via its being electrically in line with the electrically powered antennae.

[**Summary of the Inventions col. 3, lines 15 to 20**] "and an electrode [180] positioned adjacent the region and connected to the RF power source for capacitively coupling RF power to the gas in the interior of the vacuum chamber".

[**Col. 5, lines 9 and 10**] *The auxiliary electrode 180 is connected to the top winding 140c of the induction coil 140.*

Based on the foregoing, it is respectfully submitted that the deficiency A relative to Raaijmakers remains and thus a prima facie case of obviousness has not been established.

With reference to deficiency B above, there is indicated in the Office Action the following:

"Nowak teaches a simultaneous or limited overlap period for the transition of the plasma (col. 6 lines 28-35)"

As indicated by the reliance on Qian (as discussed below), it is recognized in the Office Action that Nowak fails to disclose or suggest the sequence described in claims 5 and 6 involving the timing of shutting down the second high frequency power source to the mount. A review of Nowak reveals the reason why there is lacking such a shutdown timing sequence. That is, in Nowak there is described an advantage in maintaining a capacitive coupling throughout the Nowak process, with the use of the inductive coil (if brought to power after capacitive coupling) being described as supplemental. For example, reference is made to the advantages of such a primary capacitive coupling with supplemental inductive addition arrangement set out in col. 4, lines 40 to 55 as well as the same lines noted above in Col. 6, lines 28 to 35 which describe a "supplemental" aspect in the induction coil when brought into use after a capacitive coupling (e.g., "supplemental" in the sense of assisting the on going capacitive plasma generation). Reference is also made to the Nowak's disclosure in col. 8, lines 15 to 18 regarding the "enhancement" of capacitive coupling activity with inductive activity in the context of Nowak.

In the Office Action there is a discussion of Qian with a reference by incorporation to the following discussion in the prior Office Action.

Applicant argues that since according to Qian et al., high-frequency electric power is supplied continuously to the mount (the pedestal 107) even after switching off supply of high-frequency electric power to the conducting member (the electrode 220), Qian et al. fails to teach that the second high-frequency electric power source is stopped supplying high-frequency electric power to the mount after the first high-frequency electric power source has started the supply of the high-frequency electric power to the antenna means so that high-frequency electric power is supplied only to the antenna means. The argument is not persuasive to overcome the rejection of the applied Prior Art, because Nowak teaches that it is alternatively known to strike plasma using RF power supplied to the mount as an electrode, while preferably grounding the top electrode. (col. 4, lines 32-40)

The referenced disclosure in Nowak and Qian are respectfully submitted not to remedy the noted deficiency relative to the applied 4-way combination of references. That is, as described in Qian – there is set forth that the bias power supply 106 supplies capacitively coupled bias power during the processing. Thus, as the “alternative” disclosure of Nowak describes maintaining its capacitive coupling at all times with the benefit of adding supplemental inductive coupling and Qian describes maintaining a capacitive coupling guide function during its processing, it is respectfully submitted that the relied upon disclosure of Nowak and Qian fails to present an arrangement wherein there is the claimed shutting down sequence of the second power source set forth in independent claims 5 and 6 and dependent claim 28, for example. Reference is also made to MPEP 2141.02 (VI) with the heading “Prior Art Must Be Considered In Its Entirety, Including Disclosures That Teach Away From The Claims”, which is deemed applicable to the asserted reliance on the chosen features in Nowak and Qian in the four way combination in rejection A.

Thus, as seen from the discussion above concerning deficiencies A and B, it is respectfully submitted that each of independent claims 5, 6 and 27 stand in condition for allowance relative to rejection A above, and that all dependents thus also stand in condition for allowance.

Further, new claims 32 to 34 proved further detail to the relationship between the conductive member, mount and second high frequency electric power source which is not disclosed or suggested in the references utilized in the prior art rejection.

Moreover, under the present invention, independent claims 5, 6 and 27 have been amended to include the feature of operating under a low pressure range of 0.1 to 100 mTorr. In this regard, Nowak et al., which was relied upon for its “alternate” disclosure, discloses three processes as described in column 7, lines 3-55 as follows. Applicants further note that each process is carried out under the conditions shown below.

(1) Chemical vapor deposition

Pressure:	low pressure below 100 mTorr
Ceiling electrode 24:	grounded
Coil antenna 26:	RF applied

- (2) Chamber clean operation
 - 2-1 Plasma striking stage
 - Pressure: high pressure 0.5 - 5 Torr
 - Ceiling electrode 24: RF applied
 - Coil antenna 26: grounded
 - 2-2 Post plasma striking stage
 - Pressure: high pressure 0.5 - 5 Torr
 - Ceiling electrode 24: no clear description
 - Coil antenna 26: may be connected to RF
- (3) Sputtering or etch operation
 - "same as chamber clean operation with the exception that the coil antenna 26 remains disconnected or grounded throughout."

The chamber clean operation method above is of interest because only the chamber clean operation has a plasma striking stage and a post plasma striking stage which is achieved by connection coil antenna 26 to RF after the plasma is struck. As noted above, there is lacking an indication that ceiling electrode 24 is disconnected from RF in the post plasma striking stage, and the remaining disclosure of Nowak describes advantages in not shutting down the capacitive coupling.

The description in column 4, line 65 through column 5, line 3 of Nowak et al., is also informative. That is, as described in column 4, line 65 through column 5, line 3 of Nowak, the inductively coupled plasma, in which only coil antenna 26 is connected to RF, needs to reduce the pressure down to less than 30 mTorr to maintain the plasma. In other words, in the chamber clean operation of Nowak et al., which is operated under a high pressure range of 0.5 – 5 Torr, the ceiling electrode 24 should be continued to be connected to RF even after a coil antenna 26 is connected to RF.

Therefore, in accordance with the description in column 4, line 65 through column 5, line 3 of Nowak et al. and technical common knowledge, Applicants respectfully submit that it is clear that Nowak et al. only disclose a chamber clean operation in which the coil antenna 26 is connected to RF in addition to ceiling electrode 24, and that a high pressure range of 0.5 – 5 Torr would be applicable.

This is unlike the claimed process carried out by the present invention wherein the process is thoroughly operated under a low pressure range of 0.133 – 13.3 Pa (0.1 – 100 mTorr).

Accordingly, for this reason as well, it is respectfully submitted that independent claims 5, 6 and 27 patentably distinguish over the combination in Rejection "A".

Claims 9 and 17 stand rejected as being unpatentable over Raaijmakers et al. (US 5,460,689) in view of Nowak et al. (US 6,220,201) in view of Forster et al. (EP 0 685 873 A1) in view of Qian et al. (US 6,447, 636) as applied to claims 6, 6, 8, 14-16 and 20-30 above and further in view of Brcka (US 6,652,711). Also, Claims 10-11, 18-19 and 31 stand rejected as being unpatentable over Raaijmakers et al. (US 5,460,689) in view of Nowak et al. (US 6,220,201) in view of Forster et al. (EP 0 685 873 A1) in view of Qian et al. (US 6,447, 636) in view of Brcka as applied to claims 9 and 17 and further in view of Liu et al. (US 6,776,170). The rejection as to claims 9-11 and 17-19 are traversed.

With respect to claims 9-11, 17-19 and 31, arguments for claims 5, 6 and 27 are respectfully submitted to be equally applicable herein. Accordingly, Applicant solicits withdrawal and reconsideration of claims 9-11 and 17-19.

CONCLUSION

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Therefore, it is respectfully requested that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. However, in the event that additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. 1.136(a), and any fees required therefore are hereby authorized to be charged to Deposit Account No. 02-4300, Attorney Docket No. 033082R167.

Respectfully submitted,
SMITH, GAMBRELL & RUSSELL, LLP

By:



Dennis C. Rodgers, Reg. No. 32,936
1130 Connecticut Avenue, N.W., Suite 1130
Washington DC 20036
Telephone: 202-263-4300
Facsimile: 202-263-4329

Date: March 30, 2009

SGRDC(332549.4